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GB A 2074209	GB 0974086	GB 0655496
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(58) Field of search
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E1K
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E04C

(54) Improvements in and relating to a beam for use in buildings

(57) A beam construction comprises a main beam section (10), a bracing strut (30, 32, 34) which extends beneath the main beam section and is attached to it at each end, and compression struts (36, 38) extending between the main beam section and the bracing strut. When the beam is loaded, the bracing strut is put in tension and the compression struts are put in compression, to resist bending of the main beam section. The struts may be formed of tubular stock and may be welded together before being assembled, e.g. by bolting, to the main beam section.

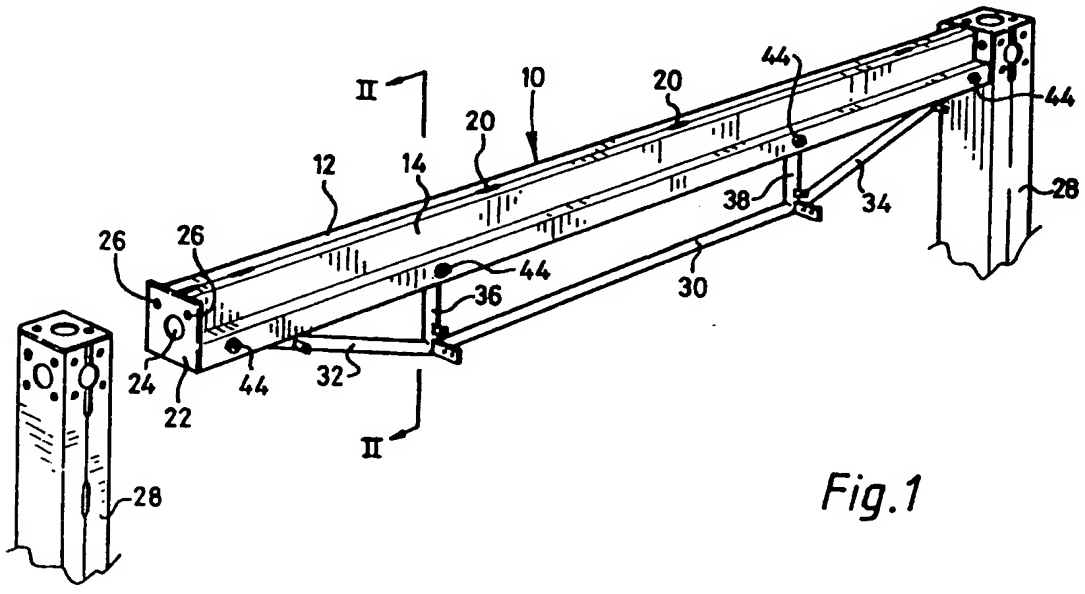

Fig.1

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The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

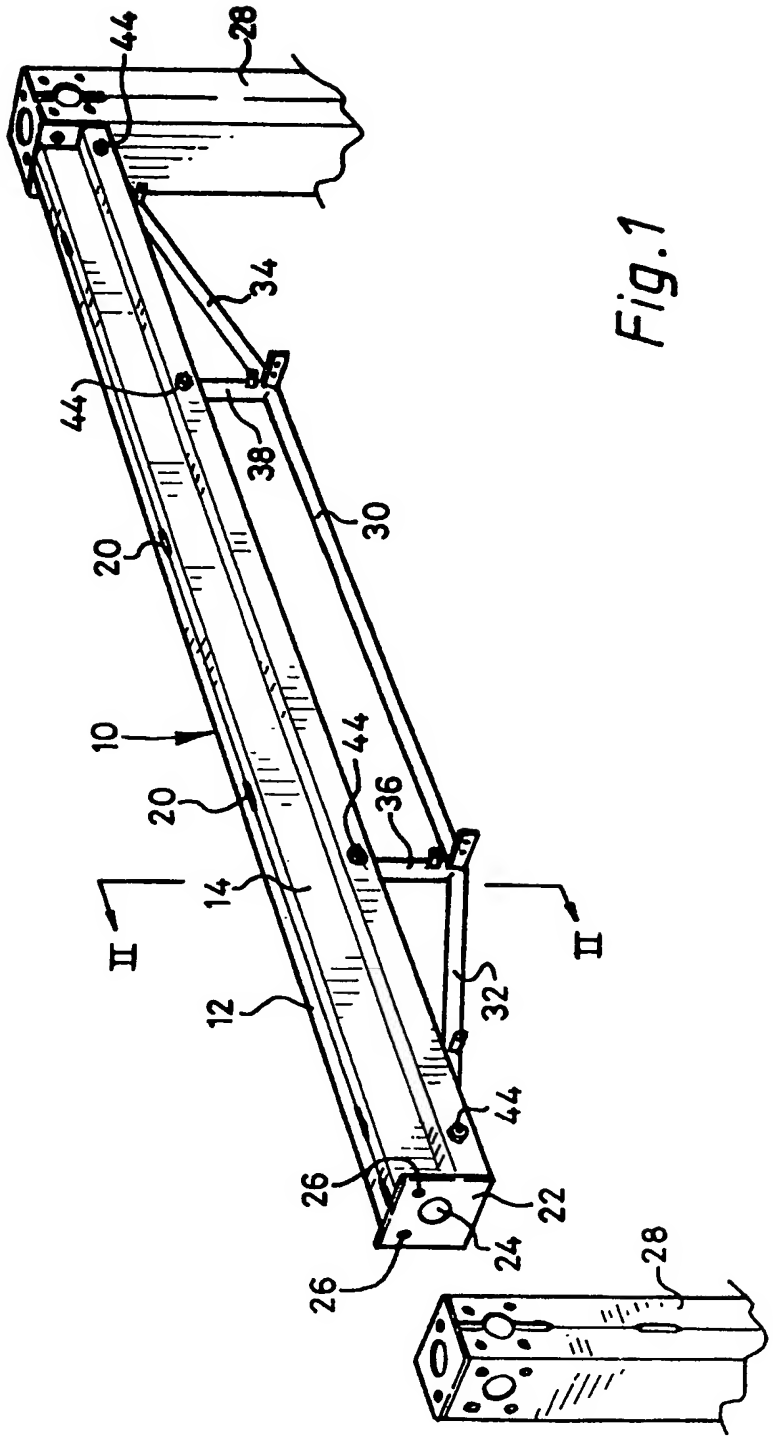

Fig.1

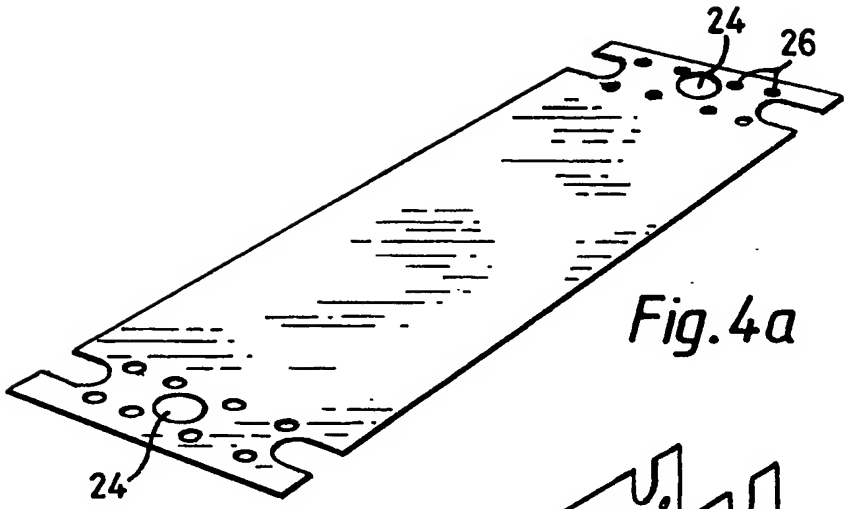

Fig.4a

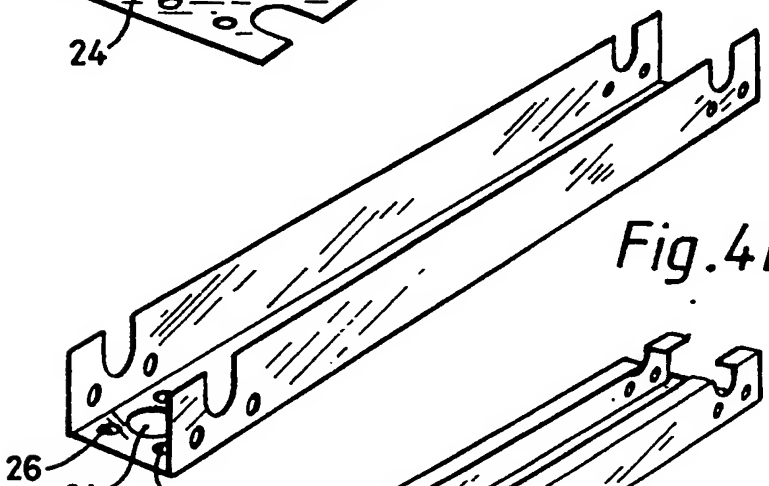

Fig.4b

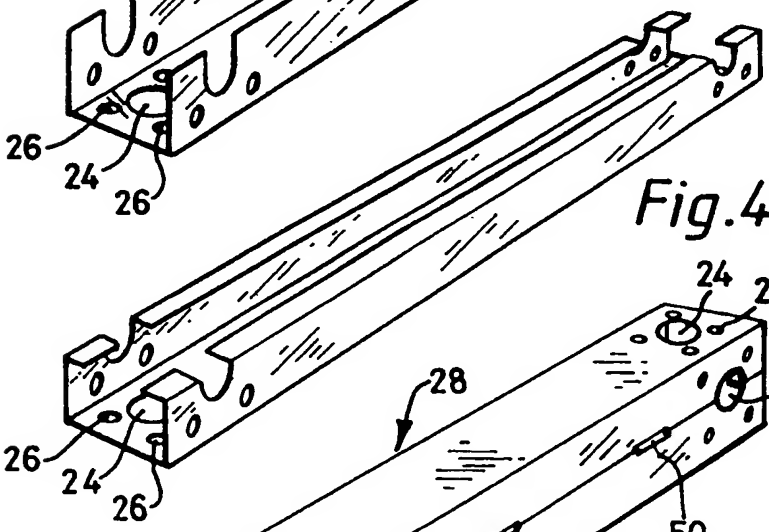

Fig.4c

Fig.4d

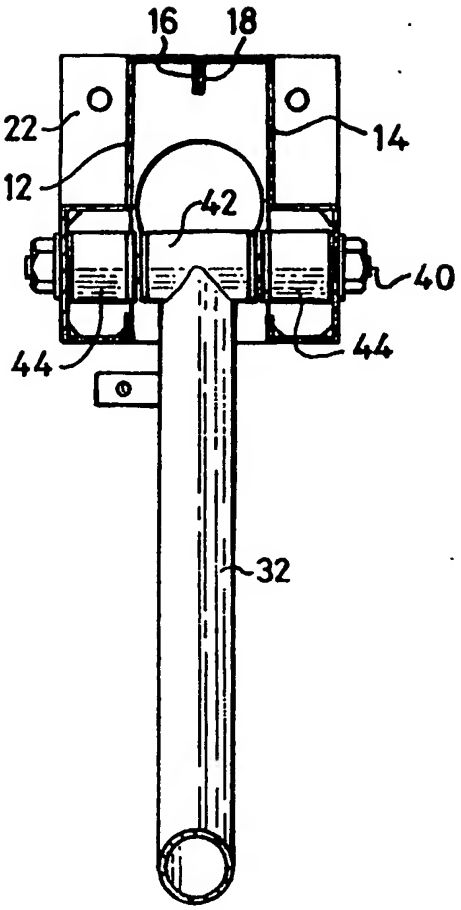

Fig.2

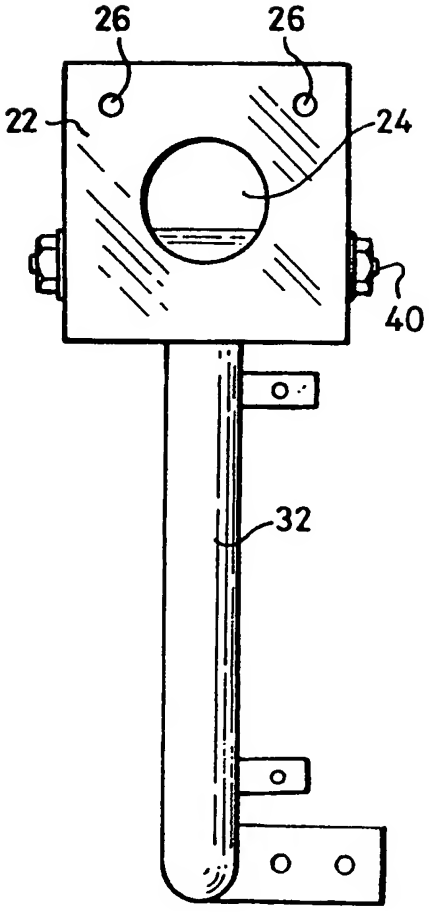

Fig.3

SPECIFICATION

Improvements in and relating to structural elements for use in buildings

Field of the invention

This invention concerns structural elements for buildings, and in particular prefabricated buildings of the type described in our pending British Patent Application No. 8424523 filed 28th September 1984.

Summary of the invention

According to a first aspect of the invention, there is provided a beam construction for use in constructing a modular, prefabricated building, the beam comprising a main beam section and, beneath the main beam section, a bracing strut which extends parallel thereto over a substantial portion of its length, converging with the beam at its opposite ends where it is secured thereto, and is spaced from the main beam section by compression struts located at the ends of the parallel portion. Thus, when the main beam section is loaded, the bracing strut will be put into tension and the compression struts will be put into compression to resist bending of the beam.

The bracing and compression struts can be made from tubular stock which can be welded up before assembly to the main beam structure.

Assembly to the main beam structure can be through bolted, pinned or welded joints or any other suitable fastening method.

This construction allows a main beam of constant section to be used to span different and substantial distances, with the bracing structure providing the necessary additional strength over distances where the main beam section alone would not be sufficiently strong.

The provision of the bracing strut has additional advantages beyond the strengthening of the beam, in that it provides a support for a suspended ceiling, and also defines below the main beam a passageway for services such as air conditioning trunking.

Because a constant main beam section can be used, connection to other components of a modular building in accordance with the "node" principle described in our earlier application 842453 can still be effected whatever distance the beam is required to span.

According to a second aspect of the invention, there is provided a method of manufacturing columns for prefabricated buildings, wherein each column has a closed cross-section and is formed by two sheet metal plates which are suitably apertured, folded to produce C-shaped cross-sectional shapes, to be secured together with the inturned flanges of the C-shape in contact.

The abutting flanges of the two sections are preferably welded together.

Such a column may be apertured to provide an inter-connecting node at one or both ends.

Preferably the aperturing is effected whilst the sheet metal is still in plate form.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a beam structure in accordance with the invention shown in conjunction with two vertical columns;

Figure 2 is a section through the beam of Fig. 1 on the line II–II;

Figure 3 is an end view of the beam of Fig. 1; and

Figures 4a, 4b, 4c and 4d show four stages in the manufacture of a column.

Description of preferred embodiments

The beam shown in Fig. 1 has a main structure 10 formed from two separate metal sections 12 and 14. The cross-section of these two sections can be seen from Fig. 2. The sections have mating flanges 16 and 18 at their top edges, and these flanges are placed in contact with one another. The two sections are welded together at various points 20 along the length of the beam. At the ends of the beam end plates 22 are fitted, again by welding to the sections 12 and 14. The end plates have central apertures 24 and fastening apertures 26 which register with corresponding apertures in the tops of the columns 28 which are shown in Fig. 1. These columns are described in more detail in our earlier application No. 8424523.

The beam is strengthened by a "bow string" bracing strut 30 suspended beneath the main portion of the beam. This central section of the bracing strut 30 is parallel to and spaced from the beam and at its end, the bracing strut converges on the beam through angled portions 32, 34. At the ends of the parallel portion, compression struts 36 and 38 are fitted. The bracing strut made up from sections 30, 32, 34, 36 and 38 can be formed from welded steel tube connected to the main beam section by means of bolts 40 passing through suitable pipe bushes 42 at the ends of the various bracing strut portions. In order to support the bracing strut relative to the main beam portion, tubular stiffeners 44 are welded into the beam sections 12 and 14, and a bolt 40 passes through both of the stiffeners 44 as well as through the pipe bush 42.

The connection described between the bracing strut and the main beam portion allows some relative movement between these components. Alternatively, however, the components could be locked up tight or could even be welded together in place of the bolted connection 40.

Figs. 4 show how the columns 28 can be formed. The column starts from two flat sheets, each of which is as shown in Fig. 4a.

Holes 24 and 26 are punched at each end whilst the metal sheet remains flat. Because two of the holes 24 will be formed in the sides of the column, partly in one sheet and partly in the other sheet, these holes are blanked out as slots ending in semi-circular regions.

The flat sheet is then bent into a U-shaped channel as shown in Fig. 4b, and the U-shaped channel is then further bent to form a C-shaped channel as shown in Fig. 4c.

A second identical C-shaped channel is then inverted over the first so that the two combine as shown in Fig. 4d to form a square column. The two channels are then welded together at various points along their length as indicated at 50. This is thus a very quick and inexpensive way to produce the columns 28.

CLAIMS

1. A beam construction for use in constructing a modular, prefabricated building, the beam comprising a main beam section and a bracing strut adapted to be located beneath the main beam section in use, the bracing strut having a main portion which extends parallel to and is spaced from the main beam section over a substantial portion of the length of the bracing strut, and inclined end portions converging with and secured to the main beam section at opposite ends of the bracing strut, and compression struts secured to and extending between the main beam section and the bracing strut at the ends of the bracing strut main portion.

2. A beam construction according to claim 1, in which the bracing and compression struts are joined to the main beam section by bolts.

3. A beam construction according to claim 1, in which the bracing and compression struts are joined to the main beam section by welding.

4. A beam construction according to claim 1, in which the bracing and compression struts are pinned to the main beam section.

5. A beam construction according to any one of the preceding claims, in which the bracing and compression struts are tubular.

6. A beam construction according to claim 5, in which the bracing and compression struts are joined by welding.

7. A beam construction according to claim 6, in which the bracing and compression struts are welded together before assembly to the main beam section.

8. A beam construction according to any one of the preceding claims, wherein the bracing strut has a length similar to that of the main beam section.

9. A beam construction according to any one of the preceding claims, further comprising a respective end plate secured to each end of the main beam section.

10. A beam construction according to claim 9, wherein the end plates are apertured and adapted for connection to corresponding apertures in upright columns.

11. A beam construction substantially as herein described with reference to, and as shown in, Figs. 1 to 3 of the accompanying drawings.

12. A method of manufacturing a column of closed cross section from two sheet metal plates for use in prefabricated buildings, comprising folding each plate to produce a U-shaped form with inturned flanges at the edges, ie a C-shaped cross-sectional shape, and securing the two folded plates together with the inturned flanges in contact.

13. A method according to claim 12, in which the abutting flanges of the two sections are welded together.

14. A method according to claim 12 or 13, in which the column is apertured at one or both ends.

15. A method according to claim 14, in which the aperturing is effected whilst the sheet metal is still in plate form.

16. A method of manufacturing a column substantially as herein described with reference to Figs. 4a to 4d of the accompanying drawings.

17. A column constructed according to the method of any one of claims 12 to 16.

18. A beam construction according to any one of claims 1 to 11 connected to a column according to claim 17.

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